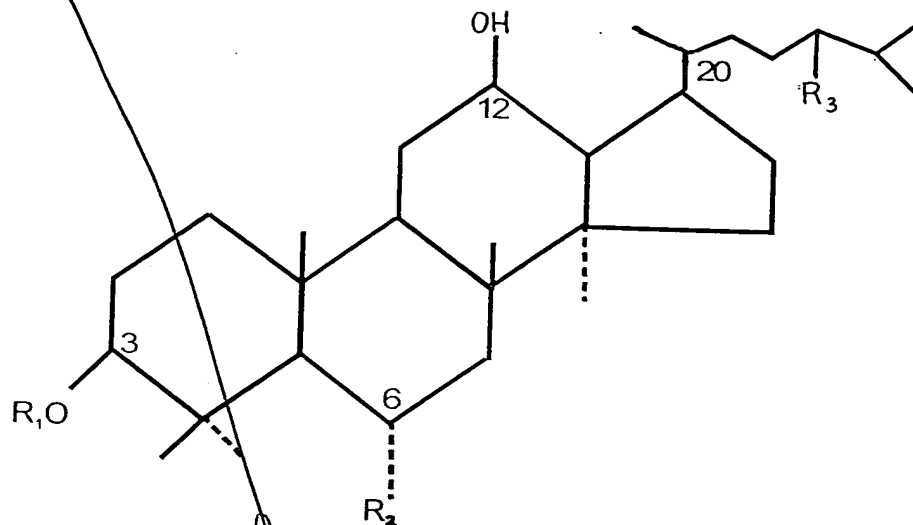


WHAT IS CLAIMED IS:

1. A sapogenin according to the formula:



wherein R_1 is H, glc or glc^{1-2} glc, R_2 is H or OH, R_3 is H or OH; and when R_1 , R_2 and R_3 are H, there are double bonds at positions 20(21) and 24(25); and when R_1 is H, R_2 is OH and R_3 is OH, there are double bonds at positions 20(22) and 25(26); and when R_1 is H, R_2 is OH and R_3 is H, there are double bonds at positions 20(22) and 24(25); and when R_1 is glc, R_2 is H and R_3 is H, there are double bonds at positions 20(21) and 24(25); and when R_1 is glc^{1-2} glc, R_2 is H and R_3 is H, there are double bonds at positions 20(22) and 24(25); and pharmaceutically acceptable compositions incorporating said sapogenins.

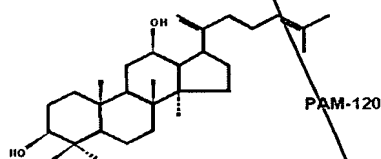
2. A sapogenin as claimed in claim 1 wherein R_1 , R_2 and R_3 are H, and there are double bonds at 20(21) and 24(25).
3. A sapogenin as claimed in claim 1 wherein R_1 is H, R_2 and R_3 are OH, and there are double bonds at 20(22) and 25(26).
4. A sapogenin as claimed in claim 1 wherein R_1 is H, R_2 is OH and R_3 is H, and there are double bonds at 20(22) and 24(25).
5. A sapogenin as claimed in claim 1 wherein R_1 is glc, R_2 and R_3 are H, and there are double bonds at 20(21) and 24(25).

6. A sapogenin as claimed in claim 1 wherein R1 is $\text{glc}^{1-2}\text{glc}$, R2 and R3 are H, and there are double bonds at 20(22) and 24(25).

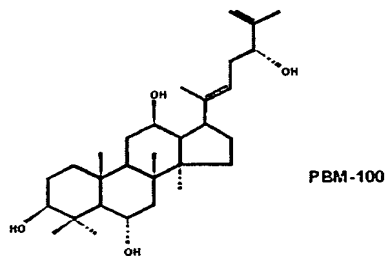
7. The use of a sapogenin according to the formula recited in claim 1 in treating cancer cells in a human being suffering from cancer, comprising killing cancer cells, inducing apoptosis in cancer cells, or inhibiting multiplication of cancer cells, or any combination thereof.

8. The use of a sapogenin according to the formula recited in claim 1 in treating multi-drug resistant cancer cells (MDR) in a human being suffering from cancer, comprising using the sapogenins either singly, or in combination with one another, or in combination with other chemotherapy agents.

9. A sapogenin according to the formula:

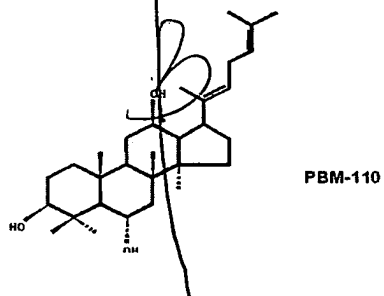


10. A sapogenin according to the formula:

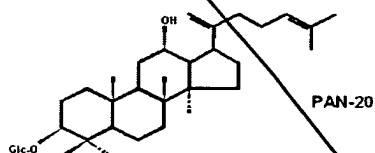


11. A sapogenin according to the formula:

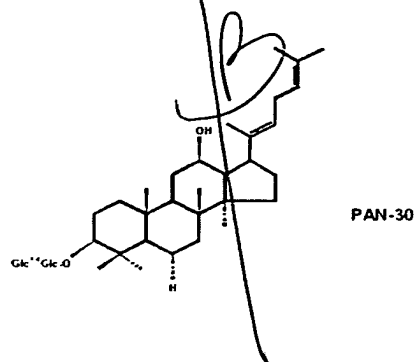
5



12. A sapogenin according to the formula:



- 10 13. A sapogenin according to the formula:



Sub
B10

Sub
B10

14. A method of treating cancer in human beings or other animals suffering from cancer comprising administering to said human beings a therapeutically effective amount of a composition comprising one or more of PAM-120, PBM-100 and PBM-110.

15. A method of treating cancer in human beings or other animals suffering from cancer comprising administering to said human beings a therapeutically effective amount of a composition comprising one or more of PAN-20 and PAN-30.

16. The cancer-treatment method of claim 14 comprising a pharmaceutically effective amount of PAM-120, PAM-100 and PBM-110 with or without one or more pharmaceutically acceptable carriers, and one or more chemotherapeutic agents.

17. The cancer-treatment method of claim 14, wherein the active ingredient is administered in a dosage of between 5 micrograms to 50 grams per kg body weight per day.

18. The cancer-treatment method of claim 14, wherein the active ingredient is administered in a dosage of between 50 micrograms to 5 grams per kg body weight per day.

19. The cancer-treatment method of claim 17, wherein the form of the composition is selected from the group consisting of an orally administrable form, an injectable form, and a topically applicable form.

20. The cancer-treatment method of claim 19, wherein the orally administrable form is selected from the group consisting of a tablet, a powder, a suspension, an emulsion, a capsule, a granule, a troche, a pill, a liquid, a spirit, a syrup and a lemonade.

21. The cancer-treatment method of claim 19, wherein the injectable form is selected from the group consisting of a liquid, a suspension and a solution.

22. The cancer-treatment method of claim 19, wherein the topically applicable

B10

form is selected from the group consisting of a drop, a paste, an ointment, a liquid, a powder, a plaster, a suppository, an aerosol, a liniment, a lotion, an enema and an emulsion.

BP 5 23. The cancer-treatment method of claim 14, wherein the composition is administered to human beings who are receiving one or more other anti-cancer treatments.

10 24. ~~The cancer-treatment method of claim 15, wherein the composition is administered to human beings who are receiving one or more other anti-cancer treatments.~~

15 25. ~~The cancer-treatment method in claim 14, wherein the composition is formulated with one or more other anti-cancer agents, for additive treatment effects, or synergistic treatment effects on multi-drug resistance cancers or any other cancer type.~~

20 26. ~~The cancer-treatment method in claim 15, wherein the composition is formulated with one or more other anti-cancer agents, for additive treatment effects, or synergistic treatment effects on multi-drug resistance cancers or any other cancer type.~~

25 27. A process of preparing a sapogenin as claimed in claim 1 which comprises producing a ginsenoside extract from plants selected from the group consisting of panax ginseng, panax quinguefol and panax notoginseng, or a sapogenin source from some other plant, and proceeding according to the following steps:

(a) mixing the ginsenoside extract with water;

30 (b) (i) mixing the ginsenoside extract and water with a short-chain (1-5 carbon) alkali-metal alcoholate solution or a hydroxide-ethanol solution to produce a mixture; and

(ii) placing the resultant mixture in a reaction tank so that the resultant mixture can undergo chemical reactions under required high temperature and high pressure; or

35 (c) (i) alternatively, mixing the ginsenosides extract with ethanol; (ii) mixing the extract and ethanol with alkali-metal alcoholates solution to produce a mixture, and

(iii) placing the resultant mixture in a reaction tank so that the

Sub
B10

- 5
- (d) after the reaction is completed, collecting an intermediate product of a mix of ginsenosides and sapogenins from the ethanol mixture; and
- (e) separating the desired sapogenins from the intermediate saponin-sapogenin mixture by silica-gel-column chromatography.
- 10 28. A process as claimed in claim 27 wherein the alkali metal can be potassium or sodium.
29. A process as claimed in claim 27 wherein the hydroxide can be sodium hydroxide or potassium hydroxide.
- 15 30. A process as claimed in claim 27 wherein the alkali-metal alcoholates solution or the concentration of hydroxide-ethanol solution is 5~50% (W/V).
31. A process as claimed in claim 27 wherein the ethanol has 1~5 carbon atoms.
- 20 32. The process as claimed in claim 27 wherein the temperature of the reaction tank is between 150~300°C and the reaction pressure is between 2.5~8.4 MPa.
- 25 33. A process of preparing a sapogenin as claimed in claim 1 which comprises producing a ginsenoside extract from plants selected from the group consisting of panax ginseng, panax quinquefol and panax notoginseng, and proceeding according to the following steps:
- 30 (a) mixing the ginsenoside extract with water;
- (b) mixing the ginsenoside extract and water with a short-chain (1-5 carbon) alkali-metal alcoholate solution or a hydroxide-ethanol solution to produce a mixture; and
- (c) placing the resultant mixture in a reaction tank so that the resultant mixture can undergo chemical reactions under required high temperature and high pressure; or
- 35 (d) after the reaction is completed, collecting an intermediate product of a mix of ginsenosides and sapogenins from the ethanol mixture; and

Sub
B10

- (e) separating the desired sapogenins from the intermediate saponin-sapogenin mixture by silica-gel-column chromatography.

34. A process of preparing a sapogenin as claimed in claim 1 which comprises
5 producing a ginsenoside extract from plants selected from the group consisting of
panax ginseng, panax quinquefol and panax notoginseng, and proceeding
according to the following steps:

- 10 (a) mixing the ginsenoside extract with water;
(b) alternatively, mixing the ginsenosides extract with ethanol;
(c) mixing the extract and ethanol with alkali-metal alcoholates
solution to produce a mixture, and
(d) placing the resultant mixture in a reaction tank so that the resultant
mixture can undergo chemical reactions under required high
15 temperature and high pressure;
(e) after the reaction is completed, collecting an intermediate product
of a mix of ginsenosides and sapogenins from the ethanol mixture;
and
(f) separating the desired sapogenins from the intermediate saponin-
20 sapogenin mixture by silica-gel-column chromatography.

US 2004/0143000 A1

add
B10